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Fossil Flora of the Lower Coal Measures of Missouri. By DAVID WHITE. U. S. Geological Survey, Monograph XXXVII, 468 pp., 1900.

The coal floras are always of great interest. The present contribution is the most important that the central-West has seen since the appearance of Lesquereux's classic work of a quarter of a century ago. The title of the volume does not, however, express the real scope of the work. Most of the forms come from a single locality, near Clinton, in Henry county, Missouri, and from a single horizon — the Jordan coal. The latter is the lowest workable coal seam in the district and is only about 100 feet from the base of the Coal Measures.

While the greater part of the monograph is taken up with the minute descriptions of species, and discussions of the biological relationships of these, the chief interest to the stratigraphical geologist is centered in the data furnished for broad correlations.

Regarding the probable stage of the lower coals of Clinton in eastern sections, Mr. White says: "If we take Henry county, from which most of our evidence, both stratigraphic and paleontologic is drawn, as the stratigraphic type of the base of the Coal Measures of the state, and assume that the conditions are constant along the margin of the coal field in other counties, the evidence of the fossil plants, so far as they are now obtainable, appears to indicate the deposition of the lowest coals in the state at a time subsequent to the formation of the lower coals of the Lower Coal Measures of the eastern regions, including the Morris coal of Illinois, the Brookville and probably the Clarion coal of Ohio and Pennsylvania, yet perhaps earlier than the formation of the Darlington or upper Kittanning coals of the two states last named.

"The study of the distribution of the Henry county flora in this field shows its closest relations in coals D and E, locally known as the 'Marcy' and the 'Big' or Pittston coals. But in view of the fact that the E coal of the Pittston and Wilkesbarre regions seems to carry many types of a more modern cast, it is not likely that the Missouri stage is so high in the series as that coal. In the plants of the D coal, not only are a large part of the species identical with those from Missouri, but the flora as a whole is of a similar type. Compared, however, with the somewhat equivocal combined flora reported from the C coal, the material from the Mississippi valley appears on the whole fully as recent, while lacking many of the older types found at several of the mines correlated by stratigraphy with that coal. Hence I am inclined to regard the plants from Henry county, Missouri, as more clearly contemporaneous with those in the roof of the D or 'Marcy' coal in the northern anthracite field, though they are possibly as old as the C coal."

The reference to the unconformity at the base of the Missouri Coal Measures is full of significance. "The transgression of the water level during the early Mesocarboniferous time has already been discussed by Broadhead, Winslow, and Keyes, the state geologists. The evidence of the fossil plants not only corroborates their views in general, but it also fixes the time of the encroachment of the sea on the old coast in the region of Clinton. The paleobotanic criteria indicates that the minimum time represented by the unconformity between Jordan or Owen coal and the subjacent Eocarboniferous terrane is measured by the period required for the deposition of the Pottsville and the Clarion group of the Lower Productive Coal Measures, a series of rocks reaching a thickness of over 1200 feet in portions of the anthracite regions, and exceeding 2400 feet in southern West Virginia."

The depositional equivalent of the unconformity at the base of the Missouri Coal Measures is even more important than Mr. White has indicated. As quite recently stated there is farther south in Arkansas, a sequence of Coal Measures beneath the basal horizon of the Des Moines and Missourian series combined. In reality the geological position of the Lower Coal Measures (Des Moines series) of Missouri appears to be well up in the median part of the Middle Carboniferous instead of at the base, as generally considered. Only in Missouri, about one half of the Middle Carboniferous is unrepresented by strata. This lacking series may be represented in Arkansas by upwards of 12,000 feet of sediments!

Attention is called in the monograph to some of the obstacles to accuracy in correlation and especially to the lack of standard paleobotanic sections. If ever there were opportunity of establishing a standard section of this kind it is in the Trans-Mississippian coal field. Plant remains occurs abundantly in many localities and at many horizons extending from the very base of Des Moines, up through the Missourian, into the so-called Permian. The monograph on the Missouri fossil floras considers chiefly one locality and one horizon. In Missouri alone there are no less than 150 known localities and 30 horizons for coal plants. In Iowa there are nearly as many more.

Kansas likewise offers an equally inviting field. If a single location yields up such prodigious possibilities as Mr. White has demonstrated what may we not expect from the rest of the vast field!

C. R. KEYES.

The Devonian "Lamprey," Palaeospondylus Gunni, Traquair. By BASHFORD DEAN (Mem. N. Y. Acad. Sci., Vol. II, Part I), 1899.

This elaborate memoir of thirty quarto pages and a plate drawn and lithographed by the author himself represent a vast amount of labor expended on minute, poorly preserved, and what would seem at first sight insignificant objects, found in the Caithness flags of Scotland. The fossil remains of *Palaeospondylus* are very unsatisfactory for study, and but for the peculiar interest attaching to them as supposed representatives of Palaeozoic Lampreys, they would hardly command attention. But zoölogists have been eagerly awaiting whatever enlightenment palaeontology might offer on the relations and descent of the Cyclostomes, and when Dr. R. H. Traquair announced his discovery of *Palaeospondylus* in 1890, it was hailed with delight as a definite clew to Cyclostome genealogy.

Dr. Dean observes: "Zoölogists were by no means unwilling to accept *Palaeospondylus* as a fossil lamprey; and they even found it a difficult matter to avoid going out in the road to give it a charitable reception. The fossil came, was seen, and was currently accepted. But time has gone by and suspicion come, and the thought is by no means comforting that the wrong prodigal may have been welcomed. Is *Palaeospondylus*, then, a veritable Cyclostome, or is it at least a provisional one?" Dr. Dean's purpose in investigating this question is a critical one, and he states that he has "attempted to analyze the results of preceding writers, to contribute some further data to our knowledge of the structure of this form, and to endeavor finally to determine what conclusions are justified in assigning a place to this fossil. After accomplishing all this in very satisfactory fashion, the author takes up the classification of fishlike vertebrates in general and introduces some novel changes, which will be referred to presently.

Dr. Dean's conclusion as to the Marsipobranch nature of *Palaeospondylus* takes the form of a more emphatic denial than ever (see his previous paper in *Proc. Zoöl. Soc.*, April 1898) that it can be regarded